

REMARKS

Claims 1-20 are all the claims presently pending in the application. Claims 1 and 2 stand rejected on prior art grounds and for informalities. This Amendment amends claims 1 and 2 and adds claims 3-20. Enclosed herein is a marked-up version of the changes made to the claims by the current Amendment.

It is noted that the claim amendments are made to merely clarify the language of each claim, and not for distinguishing the invention over the prior art, narrowing the claims, or for any statutory requirements of patentability. It is further noted that, notwithstanding any claim amendments made herein, Applicant's intent is to encompass equivalents of all claim elements, even if amended herein or later during prosecution.

Regarding the prior art rejections, claims 1 and 2 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Anzai (U.S. 5,923,933) in view of Japanese Patent Application 2000-267338 (JP '338). Claims 1 and 2 also stand rejected under 35 U.S.C. § 102(b) as being unpatentable over Anzai.

These rejections are respectfully traversed in view of the following discussion.

I. THE 35 U.S.C. §112, SECOND PARAGRAPH, REJECTION

Claims 1 and 2 stand rejected under 35 U.S.C. 112, second paragraph. The Examiner alleges that the phrase "in case where the shape coefficients SF1, SF2 . . . can respectively satisfy the following conditions," is indefinite. Applicant has amended the claims to overcome this rejection. Specifically, Applicant has amended claim 1 to recite "wherein a plurality of shape coefficients SF1, SF2" and claim 2 to recite "wherein the shape coefficients SF1, SF2."

Therefore, the Examiner is requested to reconsider and withdraw this rejection.

II. THE CLAIMED INVENTION

The claimed invention, as disclosed and claimed in independent claim 1, is directed to using a plurality of shape coefficients SF1, SF2 of toners with a two-component magnetic developing agent in a developing device including toners and magnetic carriers that respectively satisfy the following conditions:

$$120 \leq SF1 \leq 170$$

$$110 \leq SF2 \leq 130.$$

A latent image is developed with the developing device by a first and a second developing roller that are disposed along the moving direction of an image carrier and rotatable in mutually opposite directions using the two-component magnetic developing agent, and the toners are supplied to the latent image on the image carrier by the first and second developing rollers.

In a conventional device and process, since the contact between the image carrier and developing rollers is strong, the quality of the image formed by the toner can be significantly degraded. Also, the leading edge of a gang black image portion can be chipped. A conventional reverse-rotation developing system also has a disadvantage that, since the force for the toners to rub against the surface of the photographic body is weak, the cleaning performance of the surface of the photographic body is poor.

The claimed invention, on the other hand, determines an optimal range of toner coefficients that are suitable to use with the present image forming apparatus to prevent excessive stress from being applied to developing device members. Therefore, in a high-speed area of image development, the life of the developing can be maintained, a good cleaning

property of the devices can be obtained, and a stabilized image quality can be realized.

THE ANZAI REFERENCE

The Examiner alleges that Anzai anticipates the claimed invention. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by Anzai. Anzai discloses an electrophotographic apparatus with a photographic drum 1 and first (61) and second (62) magnetic developing rollers that transfer a two-component magnetic developing agent from the rollers onto the drum to form a latent image (Anzai, col. 4, line 27; lines 55-65).

Specifically, Anzai determines ratios for circumferential speed $Vd1$ (for the first development roller 61) and circumferential rotating speed $Vd2$ (for the second development roller 62), relative to the circumferential speed Vd of photographic body 1. When optimal speeds are determined, the development rollers are capable of suppressing the occurrence of image faults (Anzai, col. 11, lines 15-22). Ranges for circumferential speed ratio $S1$ (e.g., $S1 = Vd1/Vp$) and circumferential speed ratio $S2$ (e.g., $S2 = Vd2/Vp$) are determined to provide a sufficient developing capability (Anzai, col. 12, lines 24-35).

Regarding the §102(b) rejection, the Examiner alleges Anzai teaches that when the ratio of circumferential speed $S1$ of developing roller 61 is set to 1.5, the ratio of the circumferential speed to roller 62 is in the range of 2 to 3 to obtain an allowable image, and that these are in the ratios cited in claims 1 and 2. However, these passages merely attempt to determine optimal ranges of circumferential rotating speed ratios for the two developing rollers 61 and 62 (col. 11, lines 15-25).

The Examiner admits that Anzai does not disclose the use of a toner having the shape

coefficients SF1 and SF2 as recited in instant claims 1 and 2, and, as detailed above, Anzai does not teach or suggest using a range of shape coefficients “wherein the shape coefficients SF1, SF2 of said toners of said two-component magnetic developing agent including toners and magnetic carriers . . . respectively satisfying the following conditions $120 \leq SF1 \leq 170$ [and] $110 \leq SF2 \leq 130$,” as described in claim 1 (emphasis Applicant’s).

For at least the reasons stated above, Applicant respectfully submits that Anzai fails to teach or suggest every feature of claims 1 and 2, and Examiner is respectfully requested to reconsider and withdraw the rejection.

THE JP ‘338 REFERENCE

Regarding the §103 rejection, the Examiner further alleges that the invention is unpatentable over being unpatentable over Anzai in view of the JP ‘338 reference. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by the Examiner’s urged combination of references.

JP ‘338 discloses a method for using a toner having shape coefficients SF1 and SF2 of 148 and 123 to address the problems with a heated fixing method which uses heat and pressure to fix an image to recording media, such as paper (see JP ‘338, paragraphs 0058-0060, Table 1 at 0075). The heating fixing method uses a heated mechanical roller to heat and pressurize an image to the recording media after the image is imprinted onto the media by a photo conductor device (see JP ‘338, paragraphs 0002).

Applicant submits that these references would not have been combined as alleged by the Examiner. Indeed, these references are directed to different objectives and different methods.

Anzai is a method for determining optimal circumferential rotating speeds for rollers in developing device 4, which are located upstream of photographic body 1.

Although both references disclose using a toner for an electrophotographic printing process, any similarities between the claimed invention and the prior art end there. JP '338 uses a different technique to solve a different problem that occurs downstream of a "photo conductor" (e.g., photographic body 1 in Anzai) (see JP '338, ¶'s 0002). The downstream heat fixing device in JP '338 cannot be combined with the upstream development device in Anzai since these two devices are located at opposite ends of an electrophotographic printer. Thus, it is clear that the Examiner's rejection is based on impermissible hindsight.

Anzai discloses determining rotating speeds of development rollers to develop a latent image using a two-component magnetic developing agent (Anzai, col. 2, lines 60-65). This process occurs in developing device 4 that is upstream of photographic body 1 (Anzai, Figure 1). JP '338 discloses a method to formulate a toner in order to improve the problem with a heat fixing method that is causing the "so-called offset phenomenon" (JP '338, paragraph 0004-0006).

JP '338 uses a different technique for a downstream process that is unrelated to the upstream development process in Anzai. In JP '338, the latent image has already been developed on a recording medium (e.g., paper). There is no teaching or suggestion within Anzai that the disclosure of JP '338 for a downstream heat fixing device is compatible to solve development problems identified by Anzai (e.g., unevenness in a direction of the developing brush in a low image density zone, a halftone image composed of mesh, crosshatch, or lines, waining of the rear end portion of the solid black portion 33, a lack of the front end portion 36) (Anzai, col. 1, lines 25-65).

Anzai states that “these image faults . . . closely relates to a circumferential speed ratio between the first developing roller and the photographic body and a circumferential speed ratio between the second developing roller and the photographic body,” (col. 2, lines 35-40). As is clear, there is no teaching or suggestion that the heat fixing methods of JP ‘338 could be combined with the development solutions to the faults with circumferential roller speeds in Anzai.

Hence, the two references would not have been combined to form the present invention.

The disparate disclosures of the two references are exemplified in the Examiner’s own comments. The Examiner admits that Anzai does not disclose the use of a toner having the shape coefficients SF1 and SF2 as recited in instant claims 1 and 2. The Examiner then cites the disclosure in JP ‘338 to solve the toner problems identified in JP ‘338 (not Anzai) as the reasons to combine with Anzai. Indeed, Anzai does not recognize or necessarily have such problems! The Examiner stated: “It would have been obvious for a person having ordinary skill in the art to use JP ‘338’s toner . . . has the toner in the image forming method discloses [sic] by Anzai, and to use a fixing device without the use of a release oil in the fixing step in said method, because that person would have had a reasonable expectation of successfully obtaining an image forming method that provides toned images on recording media without offset and without unpleasant odors,” (see Office Action, paragraph 12, p. 8).

This is nonsensical. The Examiner is attempting to mix two very different techniques and devices, the downstream fixing device with an upstream development process. JP ‘338 allegedly solves the problems of forming an image without offset due to heating fixing methods and problems with the mold-release characteristic liquid without unpleasant odors. These are problems identified within JP ‘338, not the identified faults with conventional methods in Anzai

or even the present invention.

In other words, no person of ordinary skill in the art would have combined Anzai to find the solution to problems unique to a downstream heat fixing device. As stated previously, once the image reaches JP '338's heat fixing method, the toner image is already on the recording medium and there is no need for a development process. All that is left is to seal the image to the medium.

Given these disparate objects, problems allegedly solved, and the unusual solution offered, the Examiner can point to no motivation or suggestion in the references to urge the combination as alleged. The prior art references themselves must suggest the desirability, and thus the obviousness, of making the combination, independent of the present invention.

Therefore, there is no motivation or suggestion to combine Anzai with JP '338 to teach the claimed invention. Certainly no person of ordinary skill in the art would consider combining such references, absent hindsight.

Therefore, the references would not have been combined as alleged by the Examiner. Further, even if the references would have been combined, the combination would not teach or suggest each and every element of the claimed invention.

The Examiner alleges column 12, lines 23-27 of Anzai teach that when the ratio of circumferential speed S1 of developing roller 61 is set to 1.5, the ratio of the circumferential speed to roller 62 is in the range of 2 to 3 to obtain an allowable image, and that these are in the ratios cited in claims 1 and 2. However, these passages merely attempt to determine optimal ranges of circumferential rotating speed ratios for the two developing rollers 61 and 62 (col. 11, lines 15-25). Additionally, Anzai does not teach or suggest using a range of shape coefficients "wherein the shape coefficients SF1, SF2 of said toners of said two-component

magnetic developing agent including toners and magnetic carriers are respectively defined according to" the ranges described in claim 1.

Anzai fails to teach, much more find a solution to, the problems identified with a conventional process, as disclosed by the present Application.

In a conventional process (e.g., the process in Anzai), since the contact between the photographic body and toners is strong, the quality of the image formed can be significantly degraded. Also, the leading edge of a gang black image portion can be chipped (Application, p. 3, lines 15-20). A conventional reverse-rotation developing system also has a disadvantage that, since the force for the toners to rub against the surface of the photographic body is weak, the cleaning performance of the surface of the photographic body is poor (Application, p. 4, lines 10-15). In high-speed printing with the conventional process, the problem arises where the developing ability is scarce because of the increased rotation of the photographic body, and in order to compensate this the number of rotations of the developing roller must be increased. The increase in revolutions of development rollers increases stresses on the development agent, thereby shortening the life of the development agent and impairs the stability of the quality of the image formed (Application, p. 5 , lines 18-25).

Further, when the circumferential speed ratios of a developing device exceed their optimum ranges, a range of problems occur that negatively impact the image quality and characteristic of the developing agent. Large stresses are applied to both the toner and developing agent. This causes external additives to the surfaces of the toners to embed into the toner surfaces. The toner components can be fused (spent) to the surfaces of the carriers with the result that the frictional electric charging between the toners and carriers can be insufficient. A sufficient amount of charged electricity cannot be obtained, the toners becomes

scattered, a photographic fog can increase, and the life of the developing agent can be lowered (Application, p. 7, lines 10-20). Anzai fails to address these problems with image quality that are identified by the present Application. On the other hand, the claimed invention adjusts peripheral speed ratios of the image carrier and development rollers and adjusts toner shape coefficients to determine the optimum configurations to minimize or eliminate such adverse effects to image quality.

The Examiner alleges that paragraphs 0058-0060 of JP '338 disclose a toner having shape coefficients SF1 and SF2 of 148 and 123, which are within the ranges of 120 to 170 and 110 to 130, respectively, recited in claims 1 and 2. The deficiencies of Anzai are described above. JP '338 fails to make up for these deficiencies.

However, JP '338 is unrelated to determining optimum peripheral speed ratios and toner coefficients for an upstream image carrier and developing device. Therefore, neither Anzai nor JP '338 teach or suggest "developing an electrostatic latent image formed on an image carrier with a developing device into a toner image using toners . . . wherein . . . shape coefficients SF1, SF2 of said toners of said two-component magnetic developing agent including toners and magnetic carriers . . . respectively satisfy the following conditions: $120 \leq SF1 \leq 170$ [and] $110 \leq SF2 \leq 130$," as recited in claim 1 (emphasis ours).

If Applicant assumes, arguendo, that JP '338 is relevant, these passages of JP '338 merely describe a specific type of toner to solve a specific problem of the "so-called offset phenomenon" in the heat fixing process. The Examiner has admitted that the disclosure from JP '338 is useful merely for addressing issues identified by the JP '338 disclosure (e.g., see Office Action, p. 7-8) and that there is no teaching or suggestion that the ranges of shape coefficients are optimal for development processes. For example, the fact that JP '338's toner

can be fixed without the use of a releasing oil is a problem unique to the fixing process disclosed in JP '338 and is irrelevant to the developing methods of the present Application (see Office Action, p. 7-8).

Clearly, Anzai and JP '338 do not teach or suggest the novel features of using shape coefficients to compensate for image quality problems with a developing device.

Thus, turning to the exemplary language of claim 1, there is no teaching or suggestion of "an image forming method comprising:

developing an electrostatic latent image formed on an image carrier with a developing device into a toner image using toners;

transferring said toner image onto a recording medium; and

fixing said toner image transferred onto said recording medium to thereby form a recorded image on a recording sheet;

wherein said latent image is developed with said developing device by first and second developing rollers disposed along the moving direction of said image carrier and rotatable in the mutually opposite directions using a two-component magnetic developing agent including toners and magnetic carriers, and said toners are supplied to said latent image on said image carrier by said first and second developing rollers,

wherein the moving direction of said first developing roller is opposite to the moving direction of said image carrier in a developing area, and a peripheral speed ratio ($S1 = Vm1 / Vp$) between the peripheral speed ($Vm1$) of said first developing roller and the peripheral speed (Vp) of said image carrier is set in the range of 0.8 - 2.0,

wherein the moving direction of said second developing roller is the same as the moving direction of said image carrier in a developing area, and a peripheral speed ratio ($S2$

= V_{m2} / V_p) between the peripheral speed (V_{m2}) of said second developing roller and the peripheral speed (V_p) of said image carrier is set in the range of 1.05 - 2.0, and

wherein a plurality of shape coefficients SF1, SF2 of said toners of said two-component magnetic developing agent including toners and magnetic carriers are respectively defined according to the following expressions (1), (2),

$$SF1 = (\text{maximum length of diameter})^2 / (\text{area of toner particle}) \times \pi / 4 \times 100 \quad \text{--- (1)}$$

$$SF2 = (\text{peripheral length of projected image})^2 / (\text{area of toner particle}) \times 100 / 4 \pi \quad \text{--- (2),}$$

said shape coefficients SF1, SF2 respectively satisfying the following conditions:

$$120 \leq SF1 \leq 170$$

$$110 \leq SF2 \leq 130," \text{ (emphasis Applicant's).}$$

For at least the reasons stated above, Applicant respectfully submits that Anzai, in view of JP'338, fails to teach or suggest every feature of claims 1 and 2 and that the claims are fully patentable over the cited references.

Based on the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejection.

IV. INFORMAL MATTERS AND CONCLUSION

The claims have been amended to overcome the Examiner's rejection for informalities.

Figures 1-4 have been amended to overcome the Examiner's objections. Specifically, Figure 1 to add reference numeral "12" was added to Figure 1 and the label "Prior Art" was added to Figures 2-4

In view of the foregoing, Applicants submit that claims 1-20, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in

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condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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